



Enhancing social support and knowledge perception decreases patient delay in breast cancer

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Background: Patient delay commonly appears in breast cancer (BC), but the findings for influential factors may be contaminated by recall bias. The real factors in patient delay (divided into appraisal delay and utilization delay) for women with BC urgently need to be objectively analyzed for preventing the progression of this disease.

Methods: Women meeting strict inclusion and exclusion criteria were asked to fill in a questionnaire, which included three sections of sociodemographic characteristics, medical history, and knowledge of BC. Later on, the outcomes were processed according to the verification of BC by pathological diagnosis. Then, multiple linear regression was conducted to analyze the potential factors of the delay and to explore their relations between these factors and BC.

Results: Appraisal delay is the leading component of patient delay. Appraisal delay's time distribution of a higher percentage at delay time 0–29 and >360 days, while other delay time occupies lower percentage, which is highly consistent with that of patient delay, while utilization delay mainly occurs in the 0–29 days period. Concerning the influential factors for the different phases of delay, age ($P=0.051$, $P=0.035$ separately in appraisal and patient delay), residential address ($P=0.036$, $P=0.010$) and symptom disclosure to others ($P=0.015$, $P=0.015$) led to a decrease of appraisal and patient delay. However, reasons for first medical consultation ($P=0.033$, $P=0.006$) and knowledge of BC ($P=0.027$, $P=0.002$) would accelerate appraisal and patient delay. Many factors related to hospitals, such as hospital category for first medical consultation ($P=0.030$) and examinations for first medical consultation ($P=0.055$) would reduce utilization delay.

Conclusions: Obstacles in medical consultation for younger women should be removed, and early interventions are needed to avoid progression of BC.

Keywords: Patient delay; breast cancer (BC); Chinese; delay-related factors

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Introduction

Breast cancer (BC) ranks first among the incidence of female malignant tumors worldwide. According to the data from GLOBOCAN 2012, produced by the International Agency for Research on Cancer (IARC) (1) that there were approximately 4,292,000 new Chinese cases of cancer in 2015, in which BC, the country's leading cause of cancer deaths among women under the age of 45, accounted for about 15% of total cases. Due to education, religious beliefs, and other reasons, BC is considered to be an incurable disease, whose treatment has been associated with a loss of femininity (2,3). Therefore, patients with BC often choose to delay medical consultation and treatment, which could greatly lead to more complications and progression of the disease.

Delaying medical consultation, also known as patient delay, for patients with BC is a serious issue in China. Patient delay, which is defined as the duration from self-discovered symptoms to the first consultation, is determined by factors of cognition, emotion, social relationships, living situations, and the interactions of these factors (4). This concept can be subdivided into appraisal delay (period between symptom detection and decision for consultation) and utilization/illness delay (period between decision for consultation and actually receiving later consultation) (5). An observational study in 2013 (6) showed that the 5-year survival rate for BC is only 80% if the delay exceeds 6 weeks before acquiring surgery, as compared with 90% for patients with a delay of less than 2 weeks. Two retrospective studies included populations of those who had surgery followed by chemotherapy based on SEER and NCDB showed that with per month of preoperative delay, patients' risk of death increased by 9% to 10.4% (7,8). Richards *et al.* (9) conducted a systematic evaluation of 87 studies and concluded that a delay of 3 months would have an impact on the long-term survival of patients. In most studies, medical delay of more than 90 days (3 months) was defined as prolonged patient delay (10-12). Therefore, it is critical to eliminate the factors of prolonged patient delay and improve the quality of life for patients with BC.

Thus, a questionnaire-based interview was conducted for women who needed confirmation of breast abnormality by pathological diagnosis in Sichuan Province, China. By implementing this evaluation before diagnostic verification, we effectively reduced recall biases and explored the characteristics of patient delay in women with BC. Improving the awareness of BC and taking active interventions when suspicious symptoms appear are necessary to improve patient prognosis. We present the following article in accordance

with the STROBE reporting checklist (available at <https://dx.doi.org/10.21037/gs-21-227>).

Methods

Patient enrolment and procedure

Mandarin-speaking or Sichuanese dialect-speaking women, aged ≥ 18 years, lucid, with normal comprehension and verbal expression, were recruited in the breast specialist outpatient clinics of Sichuan Cancer Hospital & Institute, Sichuan Cancer Center, School of Medicine, University of Electronic Science and Technology of China, Chengdu. Patients, who had been diagnosed before with a Breast Lesion of Imaging-Reporting and Data System (BI-RADS) by mammography or color Doppler ultrasonography, with further confirmation by pathological diagnosis, were eligible for this study. Women who refused to participate, who did not have the ability to comprehend and complete the questionnaire, whose prior breast abnormality had been diagnosed as BC or which could not be verified by pathological diagnosis, were excluded. All procedures performed in this study involving human participants were in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by Ethical Committee of Sichuan Cancer Hospital (No. SCCHEC-02-2021-033) and informed consent was taken from all the patients.

Between April 20, 2014, and June 20, 2019, women meeting the inclusion and exclusion criteria above were enrolled in the study. While awaiting their diagnostic confirmation in breast clinics, the recruited women were interviewed and asked to fill in the questionnaires after having signed informed consent. The questionnaire included three sections of sociodemographic information, medical history, and knowledge of BC. The scheduling of the questionnaire was intended to minimize recall bias, post hoc rationalization of help-seeking behavior, and selective recall. The investigator would ghostwrite the questionnaire in cases where the woman could not do so unaided due to vision impairment, education, etc. The questionnaires were immediately collected. The responses to questionnaires from patients were processed and analyzed according to the verification of BC by pathological diagnosis (*Figure 1*).

Measures

Sociodemographic characteristics

The information on patients' age, religion, education,

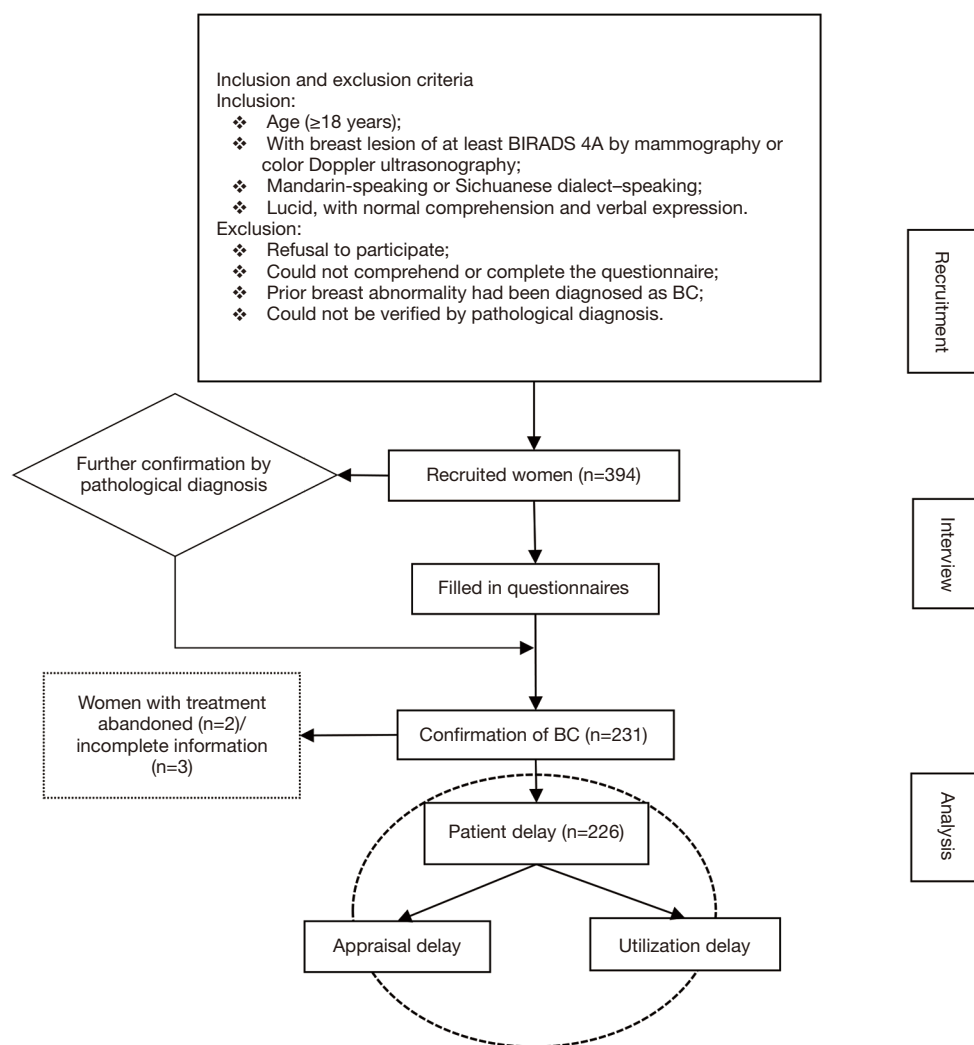


Figure 1 Research procedure of the study.

residential address, family, occupation, income, and type of medical insurance was collected.

Medical history

The questionnaire was designed based on the patient's medical history and included items on family history of BC, routine breast examination, symptom disclosure to others, underlying disease, hospital category for first medical consultation, examinations for first medical consultation, previous corresponding medical help-seeking behaviors, and others. Further emphasis was placed on medical consultation behaviors, which included items on symptoms, date, and manner of the patient's first discovery of breast abnormality (whether the lesion was benign or cancerous

by self-evaluation), and the date of patient's decision for medical consultation and actual consultation. Thus, appraisal delay (period between symptom detection and decision for consultation), utilization delay (period from deciding to receive consultation and actually being consulted) and patient delay (sum of appraisal delay and utilization delay) were calculated. The conventional cutoff of 90 days (3 months) (12,13) to categorize these delays into normal or prolonged was adopted.

Knowledge of BC

The patients' comprehension of basic knowledge, screening, risk factors, and typical symptoms and signals of BC was examined. Women were asked the following: "Will BC destroy normal tissue (sy1) or proliferate (sy2)?" and "Is BC

a malignant tumor (sy3)?” in the Basic Knowledge section. They were further asked the following: “Do you think screening can detect BC early (sc1)?”, “Do you think early detection of BC improves survival (sc2)?”, “Do you know about the time (sc3) or the technique (sc4) of breast self-examination?”, and “Do you consider mammography (sc5) or a doctor’s examination (sc6) to be a screening method for BC?” in the Screening section. Women were further queried the following: “Is the occurrence of BC is related to [age (r1)], [heredity (r2)], [obesity (r3)], [endocrine disorder (r4)], [unhealthy lifestyle (r5)], [prior BC in the other side (r6)], [benign breast disease (r7)], [exposure to high doses of radiation or prolonged environmental contamination (r8)], [estrogen (r9)] or [number of pregnancies, age of bearing or duration of lactation (r10)]?” in the Risk Factors section. Finally, they were asked the following “Do you regard [breast lump (t1)], [axillary lump (t2)], [breast pain (t3)], [nipple change (t4)], [shape change of breast (t5)] or [skin change of breast (t6)] as typical symptoms and signals of BC?”. Patients could respond “yes”, “no” or “I don’t know” in response to each of these queries.

Statistical analysis

In this study, *t*-test, analysis of variance (ANOVA), chi-square test, rank-sum test or other methods were chosen according to data type and used to perform univariate analysis on the collected information so as to screen out potential factors (a *P* value ≤ 0.2 was taken as the inclusion standard), which could affect delay of medical consultation (appraisal delay, utilization delay, and patient delay). For example, differences between groups were assessed using either Student’s *t*-test or one way ANOVA for continuous variables (such as Age, Routine breast examination), and chi squared test or rank-sum test for categorical variables (such as Residential address, Knowledge of BC). Then, multiple linear regression was conducted to analyze the potential factors and to explore their relation with BC.

The SPSS 22.0 (IBM Corp.) was used for statistical analysis. All tests were 2-sided and *P* value < 0.05 was regarded as clinically significant.

Results

Participant characteristics

Of the 394 women enrolled, 168 (42.64%) were verified with fibroadenoma, intraductal papilloma, breast cystic

hyperplasia, and concomitance of 2 or more of the diseases above, while 226 (57.36%) were subsequently confirmed to have BC [not including patients with treatment abandoned (*n*=2) or incomplete information (*n*=3)].

Overall, the age of participants with BC ranged from 27 to 71 years (mean =49.21, SD =10.03). Most patients lived in Sichuan Province (93.36%, both urban and rural areas), had no religious affiliation (98.23%), and had access to at least one type of medical insurance (99.57%). Most of the women completed junior high school (61.07%), raised 1 child (64.16%), were employed (55.76%, including blue-collar and white-collar jobs) and had an average monthly per capita income of CNY 2,000–3,999 (51.77%) (Table 1).

In the terms of medical history, only a portion of the women had a family history of BC (5.31%). Fewer than half the patients had undergone a routine breast examination (26.11%), while the majority had disclosed their breast symptoms to others (83.63%) and had been examined by color Doppler ultrasonography (75.71%) for the first medical consultation in a primary health institution (56.19%) due to concerns about their health (78.43%). Some patients indicated being occupied by other life priorities (19.87%) as the reason of not obtaining further confirmation, and that the majority of symptoms were not painful and therefore not considered to be serious (57.58%). When they sought medical consultation, most women had breast lump/pain (69.64%) and were fearful (16.50%). Most patients were diagnostically confirmed as stage 0–II BC (74.12%; Table 2). More than half of the patients showed mastery of basic knowledge (“sy1” =73.66%, “sy2” =76.79%, and “sy3” =79.46%), elementary screening (“sc1” =77.23% and “sc2” = 83.04%) and typical symptoms and signals of BC (“t1” =71.88%, “t2” =62.05%, “t3” =63.39%, “t4” =66.52%, “t5” =65.18%, and “t6” =58.93%). Fewer than 60% of women answered “yes” in risk factors “r1–10”, among which response “yes” is fewer when it comes to “r2” and “r3”, the proportion is 39.73% and 39.29% respectively. And few had learned about professional screening (“sc3.1” =38.84%, “sc3.2” =32.59%, “sc4” =42.41%, and “sc5” =53.13%; Figure 2).

Delay durations of medical consultation

Appraisal day [median 9 days; interquartile range (IQR) 112.75 days; range 0–2,199 days], utilization delay (median 2; IQR 11; range 0–734), and patient delay (median 28.5; IQR 143.5; range 0–2,206) of women with BC were separately calculated according to the collected data. In addition, both

Table 1 Sociodemographic characteristics of women with BC

Characteristics	n=226 (%)
Age (years)	
Mean ± SD	49.21±10.03
Religion	
Yes	4 (1.77)
No	222 (98.23)
Education	
Primary or below	71 (31.42)
Junior high	67 (29.65)
Senior high/Technical secondary	45 (19.91)
Bachelor/college or above	43 (19.03)
Number of children	
0	0 (0)
1	145 (64.16)
2	74 (32.74)
≥3	7 (3.10)
Occupation	
Blue collar	51 (22.57)
White collar	75 (33.19)
Unemployed	73 (32.30)
Retired	27 (11.95)
Student	0 (0)
Average monthly per capita income (CNY)	
<1,000	20 (8.85)
1,000–1,999	38 (16.81)
2,000–2,999	77 (34.07)
3,000–3,999	40 (17.70)
4,000–4,999	20 (8.85)
≥5,000	31 (13.72)
Residential address	
Sichuan Province	210 (93.36)
Others	15 (6.64)
Type of medical insurance (multiple choice)	
Typical (town residents or employees)	157 (67.97)
New rural cooperative medical system (NCMS)	65 (28.14)
Commercial	3 (1.30)
Others	7 (3.03)
None	1 (0.43)

BC, breast cancer.

Table 2 Medical history of women with BC

Characteristics	n=226 (%)
Family history of BC	
Yes	12 (5.31)
No	214 (94.69)
Routine breast examination	
Yes	59 (26.11)
No	167 (73.89)
Symptom disclosure to others	
Yes	189 (83.63)
No	37 (16.37)
Reasons for first medical consultation (multiple choice)	
Fear about own illness	200 (78.43)
Proposal from others	44 (17.25)
Physical examination	10 (3.92)
Others	1 (0.39)
Hospital category for first medical consultation	
Primary health institution	127 (56.19)
Tumor hospital	35 (15.49)
Comprehensive grade 3A hospital	64 (28.32)
Examinations for first medical consultation (multiple choice)	
Mammography	43 (15.36)
Color Doppler ultrasonography	212 (75.71)
Routine examination	7 (2.50)
Fine needle aspiration cytology (FNAC)	11 (3.93)
Others	7 (2.50)
Reasons for not obtaining further confirmation (multiple choice)	
Not painful, thought symptoms not serious	171 (57.58)
Occupied by other life priorities	59 (19.87)
Treated by traditional Chinese medicine	20 (6.73)
Awaiting medical appointments	15 (5.05)
Others	32 (10.77)
Reasons for this medical consultation (multiple choice)	
Breast lump/pain	211 (69.64)
Fear	50 (16.50)

Table 2 (continued)

Table 2 (continued)

Characteristics	n=226 (%)
Accidentally discovered under other medical consultation	8 (2.64)
Axillary lump	17 (5.61)
Others	17 (5.61)
Staging of BC	
0	5 (2.19)
I	42 (18.42)
IIA	71 (31.14)
IIB	51 (22.37)
IIIA	29 (12.72)
IIIB	7 (3.07)
IIIC	4 (1.75)
IV	17 (7.46)
Underlying disease	
Yes	51 (22.57)
No	175 (77.43)

BC, breast cancer.

appraisal delay and patient delay accounted for a higher percentage in delay time 0–29 days and >360 days, as the proportion is 62.95% and 12.50% in appraisal delay, 50.89% and 14.29% in patient delay separately. The proportion (85.27%) of women with 0–29 days of utilization delay was far higher than that of any other delay days (Table 3).

Factors associated with appraisal, utilization, and patient delay

Eight potential factors (e.g., age) that might affect the appraisal delay of women with BC and that were screened by univariate analysis (Table 4), were further analyzed by stepwise regression analysis. Consequently, the influential factors of appraisal delay (y_1) were found to be age (x_1), residential address (x_2), symptom disclosure to others (x_3), reasons for this medical consultation (x_4), and knowledge of BC (x_5). The direction and degree of the effect of these factors was determined by the following regression equation: $y_2=193.40-3.80x_1-14.11x_2-4.92x_3+15.77x_4+2.38x_5$. In particular, reasons for medical consultation [$b_4=15.77$, SE (b_4)=13.18] predicted a longer appraisal delay, while

residential address [$b_2=-14.11$, SE (b_2)=15.93] predicted a shorter one (Table 5).

Eight potential factors (e.g., number of children) that could affect utilization delay of women with BC and that were screened by univariate analysis (Table 4) were further analyzed by stepwise regression analysis. This analysis revealed that the influential factors of utilization delay (y_2) were number of children (x_1), routine breast examination (x_2), hospital category for first medical consultation (x_3), examinations for first medical consultation (x_4), reasons for not obtaining further confirmation (x_5), reasons for this medical consultation (x_6), underlying disease (x_7), and knowledge of BC (x_8). These factors' directions and degree of the effect were determined by the following regression equation: $y_2=74.99-3.16x_1-5.18x_2-2.14x_3-2.77x_4-0.49x_5+0.66x_6-0.39x_7-0.68x_8$ (Table 5).

The same process was applied to 11 factors of patient delay (y_3) for BC patients. Age (x_1), number of children (x_2), residential address (x_3), routine breast examination (x_4), symptom disclosure to others (x_5), reasons for not obtaining further confirmation (x_6), reasons for medical consultation (x_7), and knowledge of BC (x_8) were identified as the influencing factors, with the following regression equation: $y_3=242.16-4.91x_1+28.50x_2-20.98x_3-27.34x_4-97.17x_5-14.02x_6+14.56x_7+1.21x_8$. Obviously, number of children [$b_2=28.50$, SE (b_2)=39.02] and reasons for medical consultation [$b_7=14.56$, SE (b_7)=13.35] predicted a longer patient delay for BC women, while symptom disclosure to others [$b_5=-97.17$, SE (b_5)=67.51] predicted a shorter one (Table 5).

Discussion

The characteristics and related factors of patient delay for women with BC were examined and analyzed in this study. Patient delay is a key element of BC progression (14). Our questionnaire data indicated that one-third of BC women had over 90 days of patient delay; this delay is widely considered to seriously endanger health (13,15). Patient delay was divided into appraisal delay and utilization delay for further analysis. The appraisal delay's time distribution of a higher percentage at delay time 0–29 and >360 days, while other delay time occupies lower percentage, which is highly consistent with that of patient delay, while utilization delay mainly occupies the period of 0–29 days. Thus, appraisal delay is the leading component of patient delay.

Older age, nearby residential address, routine breast examination, and greater symptom disclosure to others

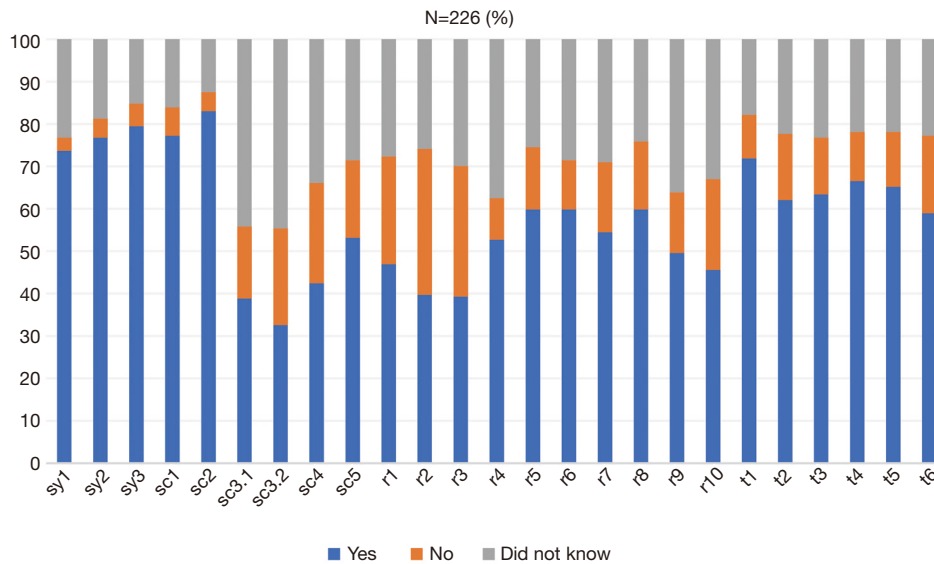


Figure 2 Knowledge of BC in women with BC. BC, breast cancer; sy1, “Will BC destroy normal tissue?” sy2, “Will BC proliferate?” sy3, “Is BC a malignant tumor?” sc1, “Do you think screening can detect BC early?” sc2, “Do you think early detection of BC improves survival?” sc3, “Do you know about the time of breast self-examination?” sc4, “Do you know about the technique of breast self-examination?” sc5, “Do you consider mammography to be a screening method for BC?” sc6, “Do you consider a doctor’s examination to be a screening method for BC?” r1, “Is the occurrence of BC is related to age?” r2, “Is the occurrence of BC is related to heredity?” r3, “Is the occurrence of BC is related to obesity?” r4, “Is the occurrence of BC is related to endocrine disorder?” r5, “Is the occurrence of BC is related to unhealthy lifestyle?” r6, “Is the occurrence of BC is related to prior BC in the other side?” r7, “Is the occurrence of BC is related to benign breast disease?” r8, “Is the occurrence of BC is related to exposure to high doses of radiation or prolonged environmental contamination?” r9, “Is the occurrence of BC is related to estrogen?” r10, “Is the occurrence of BC is related to number of pregnancies, age of bearing or duration of lactation?” t1, “Do you regard breast lump as typical symptoms and signals of BC?” t2, “Do you regard axillary lump as typical symptoms and signals of BC?” t3, “Do you regard breast pain as typical symptoms and signals of BC?” t4, “Do you regard nipple change as typical symptoms and signals of BC?” t5, “Do you regard shape change of breast as typical symptoms and signals of BC?” t6, “Do you regard skin change of breast as typical symptoms and signals of BC?”.

Table 3 Delay of medical consultation of women with BC

Day(s)	n=226 (%)		
	Appraisal delay	Utilization delay	Patient delay
0-29	141 (62.95)	191 (85.27)	114 (50.89)
30-59	13 (5.80)	13 (5.80)	21 (9.38)
60-89	8 (3.57)	7 (3.13)	14 (6.25)
90-179	15 (6.70)	7 (3.13)	25 (11.16)
180-359	19 (8.48)	1 (0.45)	18 (8.04)
360+	28 (12.50)	5 (2.23)	32 (14.29)

BC, breast cancer.

led to a decrease of appraisal/patient delay for women with BC. However, reasons for this medical consultation

and knowledge of BC prolonged appraisal/patient delay. This may be because the time for patients who are retired or unemployed and who are keen to acquire health information may increase as they age. It is also possible that the women with lower education confused their answers with the present symptoms and thus confirmed the symptom questions in the questionnaires when filling. Such as it is, women with BC have less knowledge related to the risk factors and screening—which are key parts of the problem—than they do of basic knowledge, typical symptoms, and signs of BC. Many factors related to hospitals, such as hospital category for first medical consultation and examinations for first medical consultation, could reduce utilization delay. Meanwhile, the number of child and knowledge of BC, which increases the likelihood of symptom disclosure to others to some extent, could also

Table 4 P value of univariate analysis on all factors affecting delay of medical consultation of women with BC

Factors	P value of BC		
	Appraisal delay	Utilization delay	Patient delay
Age	0.141 ^a	–	0.122 ^a
Religion	–	–	0.122 ^a
Number of children	–	0.013 ^b	0.135 ^b
Residential address	0.109 ^b	–	0.137 ^b
Family history of BC	0.055 ^c	–	0.013 ^c
Routine breast examination	–	0.219 ^a	0.159 ^a
Symptom disclosure to others	0.186 ^a	–	0.196 ^a
Reasons for first medical consultation	–	–	0.172 ^c
Hospital category for first medical consultation	–	0.205 ^c	–
Examinations for first medical consultation	0.058 ^d	0.215 ^d	0.151 ^d
Reasons for not obtaining further confirmation	<0.001 ^d	0.152 ^d	<0.001 ^d
Reasons for this medical consultation	0.184 ^d	0.026 ^d	–
Underlying disease	–	0.067 ^a	–
Knowledge of BC	0.153 ^b	0.101 ^b	0.164 ^b

^a, t-test; ^b, analysis of variance (ANOVA); ^c, chi-square test; ^d, rank-sum test; “–” denotes “P>0.2”. BC, breast cancer.

prolong utilization delay time.

In short, symptom disclosure to others and knowledge of BC play important roles in patient delay of women with BC. For one, the overall outcome of symptom disclosure to others, indicating social support from family members, immediate partners and friends, was reported by some studies to be positive for women, in that it led to informational and emotional support (16-22). Mohadesi *et al.* (23) also stated that social and emotional support from a spouse or family members of patients with BC can reduce mental distress experienced during the diagnosis process. Meanwhile, obstacles should be removed so as to prevent the progression of BC for younger patients who are usually occupied by work or other life priorities. Lam *et al.* (21) found that competing priorities, such as work and family commitments, can act as barriers to seeking medical help in some participants. Maintaining health should be understood as a necessary prerequisite for performing other daily duties, and personal responsibilities should not act as a barrier to seeking medical help. Therefore, logistical problems for working women should be resolved to decrease prolonged medical consultation, especially those with higher education who have competing work commitments and do not give proper attention to health demands (19).

A large number of studies on patient delay in BC and delay-related factors have been published in recent years (14,16,21,24). It has been found that women’s fear of cancer and their prolonged patient delay usually results in patients’ being in the middle or even advanced phase of the BC once finally diagnosed (25). In line with this, women with BC of IIA and IIB account for 53.51% of the cases in this study, which is indeed an ominous sign. Even with early detection, the mental burden to patients and living under the shadow of cancer will have an unfavorable influence on the control of disease. The symptoms of BC are easily ignored by patients without specialized knowledge, and the prolonged patient delay increases the risk of malignant transformation.

In addition, people are more vulnerable to diseases and suffer from worse emotional and psychological problems as they increase in age. Hence, the knowledge of the risk factors and screening methods of BC also needs strengthening for women with BC to avoid these complex delay-related factors as they age. Physical examination may be helpful in breast cancer screening, but there is no evidence that it can improve early diagnosis of breast cancer and reduce its mortality. Some measurements, such as preventive publicity and routine breast examination, for early diagnosis and treatment of breast diseases may

Table 5 Regression results of appraisal, utilization, and patient delay

Variables	Coefficient of partial regression (b)	Standard error (se)	Standardized partial regression coefficient (β)	t	P value
Appraisal delay					
Constant term	193.40	223.07	–	0.87	0.387
Age (x_1)	–3.80	2.17	–0.105	1.75	0.051
Residential address (x_2)	–14.11	15.93	–0.050	1.89	0.036
Symptom disclosure to others (x_3)	–4.92	66.66	–0.082	2.42	0.015
Reasons for this medical consultation (x_4)	15.77	13.18	0.067	1.20	0.033
Knowledge of BC (x_5)	2.38	2.42	0.055	1.98	0.027
Utilization delay					
Constant term	74.99	26.03	–	2.88	0.004
Number of children (x_1)	–3.16	5.85	–0.031	–0.54	0.049
Routine breast examination (x_2)	–5.18	5.99	–0.049	–0.86	0.038
Hospital category for first medical consultation (x_3)	–2.14	2.20	–0.057	–0.98	0.030
Examinations for first medical consultation (x_4)	–2.77	4.68	–0.036	–0.59	0.055
Reasons for not obtaining further confirmation (x_5)	–0.49	2.05	–0.013	–0.24	0.013
Reasons for this medical consultation (x_6)	0.66	2.16	0.017	0.31	0.059
Underlying disease (x_7)	–0.39	8.57	–0.003	–0.05	0.003
Knowledge of BC (x_8)	–0.68	0.40	–0.098	–1.71	0.008
Patient delay					
Constant term	242.16	238.37	–	1.02	0.310
Age (x_1)	–4.91	2.31	–0.134	–2.12	0.035
Number of children (x_2)	28.50	39.02	0.044	0.73	0.046
Residential address (x_3)	–20.98	16.70	–0.073	–1.26	0.010
Routine breast examination (x_4)	–27.34	13.85	–0.116	–1.98	0.049
Symptom disclosure to others (x_5)	–97.17	67.51	–0.082	–1.44	0.015
Reasons for not obtaining further confirmation (x_6)	–14.02	12.82	–0.061	–1.09	0.027
Reasons for this medical consultation (x_7)	14.56	13.35	0.061	1.09	0.006
Knowledge of BC (x_8)	1.21	2.49	0.028	0.49	0.002

BC, breast cancer.

be targeted and effective, and have been recommended by Gangane *et al.* (2). These researchers claimed that only 6.6% of women in their study of 384 cases in India had heard about breast self-examination, and thus there needs to be a better policy to focus on education and convey the positive message that BC is treatable. Every year, October is named as Breast Cancer Awareness Month, during which

international health campaign lasting the whole month. Breast cancer health education cannot be limited to the awareness month, but can also be carried out in daily life. Organizations, medical societies and government agencies can work together to improve public awareness about breast cancer through textbooks, community education, new media as well as oriented education. Because of the cost

and uncertainty surrounding BC screening, the emphasis should be concentrated on prevention. There are many screening measures for breast cancer including annual visits to specialists for physical examination, breast self-examination, mammogram, ultrasound, and breast MRI. It has been shown that screening mammography can reduce at least 20% breast cancer mortality by eight RCT (randomized clinical trials) (26). And the positive predictive value of ultrasonography and MRI screening is 3–8% and 90–93%, separately (27–29). But we should concentrate on prevention. And BC prevention includes etiological prevention like surgery, medication and lifestyle options for women at increased risk for BC (30), secondary and tertiary prevention. Avoidance of hormonal therapy, late pregnancy, low number of births or no pregnancy, advanced age at first full-term delivery, and living a healthy lifestyle could decrease the risk of BC (31,32). Early detection, diagnosis and treatment can improve the cure and survival rates. Moreover, their study indicated that clearing barriers of utilization delay in primary health institutions should also be taken into consideration.

Our retrospective study spanned over 5 years, which might have introduced some bias. Our survey was chosen to be done when patients were in the outpatient clinic for a waiting visit, having minimized artificial bias. With a duration of 5 years, there may indeed be a gap in the population's level of breast cancer knowledge. We had explained the options and some knowledge about breast diseases to the patients in detail to minimize the influence of understanding errors on the questionnaire results before they filled out the questionnaire. We could continue such a study at a later stage, grouping by year of inclusion and analyzing whether the year of inclusion affects the results. As reported, menopausal changes can confound detection of suspicious symptoms (25). Furthermore, married or cohabiting patients had higher scores in the quality of life than those who were living alone or divorced. This could be explained by the financial and emotional support provided to patients by their immediate partners (33,34). Both of these phenomena were not considered in this study and need to be further explored in future research. Moreover, women with a high fear of cancer diagnosis may be more likely to use avoidant coping and therefore may delay seeking medical consultation, but these psychological factors were not taken into account in our analysis. Meanwhile, no collection statistics about survival were performed in our study because the initial treatment modality of patients in our study included post-surgical

chemotherapy and neoadjuvant chemotherapy followed by surgery, the time from diagnosis to surgery in our center was basically controlled within 2 weeks for those treated with post-surgical chemotherapy. Women meeting the inclusion and exclusion criteria were enrolled between April 20, 2014 and June 20, 2019 in our study, the follow-up time is short for some patients. Thus, there are limitations in our study, we are looking forward to get the long follow-up data of those women included to illustrate how the patient delay affect the OS and DFS in our study.

Nonetheless, this study has advantages over previous patient delay studies, in that we recruited women before the confirmation of BC diagnosis, which avoided the effects of rationalization in help-seeking behavior, and distortion or misrepresentation of symptom duration and decision making (35). Using a regression equation to present how these factors interact to influence patients' help-seeking decisions will advance our understanding in the patient delay of women with BC. Above all, it is critical that cost-effective interventions, such as enhancing social support and perception of knowledge on BC, be implemented for early BC detection in Sichuan Province, China, which may act as a model for other places in the future.

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are

appropriately investigated and resolved. All procedures performed in this study involving human participants were in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by Ethical Committee of Sichuan Cancer Hospital (No.: SCCHEC-02-2021-033) and informed consent was taken from all the patients.

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